Patent Claims

1. Method for the plastic deformation of polymers, characterized in that a polymer is treated with electromagnetic radiation having a wavelength in the range from 0.8 to 100 μm with simultaneous action of pressure and shearing and thermal energy.

2. Method according to Claim 1, characterized in that heat is supplied to the polymer or heat is removed from the polymer during the method.

3. Method according to Claim 1 or 2, characterized in that the electromagnetic radiation is laser radiation.

4. Method according to any of Claims 1 to 3, characterized in that the electromagnetic radiation has a wavelength in the range from 1 to 50 μm.

5. Method according to any of Claims 1 to 4, characterized in that the pressure acting on the polymer is in a range from 1 N/mm^2 to 5000 N/mm^2.

6. Method according to any of Claims 1 to 5, characterized in that the shearing is applied with a force or a torque such that a shear rate in the range from 10^0 to 10^6 s^{-1} acts on the polymer.

7. Method according to any of Claims 1 to 6, characterized in that the polymer comprises a

polymer which can form intermolecular hydrogen bridge bonds.

8. Method according to Claim 7, characterized in that the polymer which can form intermolecular hydrogen bridge bonds is a polysaccharide or polyvinyl alcohol.

9. Method according to Claim 8, characterized in that the polymer which can form intermolecular hydrogen bridge bonds is cellulose, chitin, polyvinyl alcohol, a constitutional isomer of cellulose, a constitutional isomer of chitin or a blend of one or more of the above polymers.

10. Method according to Claim 9, characterized in that the polymer which can form intermolecular hydrogen bridge bonds is cellulose.

11. Method according to any of Claims 1 to 10, characterized in that the polymer is melted by means of electromagnetic radiation having a wavelength in the range from 0.8 to 100 μm under the simultaneous action of pressure and shearing and thermal energy and is then extruded in a manner known per to give films, spun to give fibres or processed by injection moulding to give a moulding.

12. Apparatus for carrying out the method according to any of Claims 1 to 11, characterized in that it comprises means for holding a polymer, means for exerting pressure on the polymer, means for

shearing the polymer, means for supplying or removing heat and means for irradiating the polymer with electromagnetic radiation having a wavelength of from 0.8 to 100 μm.

13. Apparatus according to Claim 12, characterized in that the means for irradiating the polymer with electromagnetic radiation having a wavelength of from 0.8 to 100 μm is a laser.

14. Apparatus according to Claim 12 or 13, characterized in that the means for shearing the polymer comprises two ram surfaces movable relative to one another.

15. Apparatus according to Claims 12 to 14, characterized in that the means for exerting pressure on the polymer are also simultaneously the means by which the polymer is sheared.

16. Polymer comprising cellulose or chitin, obtainable by the method according to any of Claims 1 to 11.

17. Polymer according to Claim 16, characterized in that it is present as a film, fibre or moulding.